[CERTIFIED TRANSLATION FROM GERMAN]

Claims

What is claimed is

1. An arrangement for the spatial display of a scene or object, comprising
- an imaging device with a great number of picture elements (pixels) (α_{ij}) in a raster of rows (j) and columns (i), in which the pixels (α_{ij})render bits of partial information from at least three views (A_k) (k = 1...n, n≥3) of the scene or object, and
- one or several arrays of a great number of wavelength and/or gray-level filters arranged in rows (q) and columns (p) and designed as filter elements (β_{pq}), part of which are transparent to light of specified wavelength ranges, whereas the remaining part are opaque to light, these array being arranged (in viewing direction) in front of and/or behind the imaging device with the pixels (α_{ij}), so that propagation directions are given for the light emitted by the pixels (α_{ij}), and in which each pixel (α_{ij}) corresponds with several filter elements (β_{pq}) assigned to it, or each filter element (β_{pq}) corresponds with several pixels (α_{ij}) assigned to it, in such a way that each straight line connecting the area center of a visible segment of the pixel (α_{ij}) and the area center of a visible segment of the filter element (β_{pq}) corresponds to a propagation direction, and in which, within a viewing space in which the observer(s) is (are) located, the propagation directions intersect in a great number of intersection points, each of which represents an observer's position, so that an observer at any of these positions will predominantly see bits of partial information from a first selection of views with one eye, and predominantly bits of partial information from a second selection of views (A_k) (k=1...n),
- **characterized in that**
- in at least a segment of at least one of the arrays, the ratio between the areas covered by filter elements transparent to light of specified wavelength ranges (β_{pq}) and the total area of all filter elements (β_{pq}), multiplied by the average number (n') of the different views displayed per row (j) of the raster of pixels (α_{ij}), is greater than 1.

2. An arrangement as claimed in Claim 1, characterized in that the filter elements (β_{pq}) transmissive to light of specified wavelength ranges are designed to be transparent filters essentially transmissive to the entire visible spectrum.

3. An arrangement as claimed in Claim 1 or 2, characterized in that the filter elements transmissive to light of specified wavelength ranges (β_{pq}) are so dimensioned that always more than one pixel (α_{ij}) is visible per visible raster segment with reference to the pixel area.

4. An arrangement as claimed in Claim 1 or 2, characterized in that the quotient of the sum of areas covered by filter elements (β_{pq}) largely transmissive to light of essentially the entire visible spectral range and the sum of the areas covered by all filter elements (β_{pq}) of the respective array adopts a value lying between the quotient Q1 = 1.1/n' and the quotient Q2 = 1.8/n', so that, because of the filter elements (β_{pq}) transmitting light of the complete visible spectrum, always about 1,1 to 1,8 pixels (α_{ij}) on average are visible per visible raster segment with reference to the pixel area.

5. An arrangement as claimed in Claim 1 or 2, characterized in that, in case of parallel projection onto the raster of pixels (α_{ij}), the segment corresponds to at least one row (j) or at least one column (i).

6. An arrangement as claimed in Claim 1 or 2, characterized in that, in case of parallel projection of a sufficiently large filter segment of at least one of the arrays of filter elements (β_{pq}) provided onto at least one row (j) or onto at least one column (i) of the raster, not less than 1.1/n' times but not more than 1.8/n' times the area of the respective row (j) or column (i) is covered by filter elements (β_{pq}) essentially transmissive to light of the complete visible spectrum, so that, because of the filter elements (β_{pq}) transmitting light of the complete visible spectrum, always about 1,1 to 1,8 pixels (α_{ij}) on average are visible per visible raster segment with reference to the pixel area.

7. An arrangement as claimed in Claim 1 or 2, characterized in that at least one first continuous belt of transparent filters extending from one edge of the array to the opposite edge, and at least one second continuous belt of transparent filters extending from one edge of the array to the opposite edge are pro-

vided, with the main directions of light propagation from these two belts on the array not being aligned in parallel with each other.

8. An arrangement as claimed in Claim 7, characterized in that at least one of the continuous belts of transparent filters provided is aligned in parallel with the upper, lower, left or right edge of the respective array of wavelength or gray level filters and/or parallel with the upper, lower, left or right edge of the raster of pixels (α_{ij}).

9. An arrangement as claimed in Claim 7 or 8, characterized in that a great number of such continuous belts of transparent filters are provided.

10. An arrangement as claimed in any of the claims 7 through 9, characterized in that at least some of the continuous belts of transparent filters are randomly distributed over array, in so far as the said belts are arranged in parallel with each other.

11. An arrangement as claimed in any of the claims 7 through 9, characterized in that at least some of the continuous belts of transparent filters are spaced at periodic distances on the array, in so far as the said belts are arranged in parallel with each other, and characterized in that preferably every m-th row (q) (with m>1) of the respective array forms such a continuous belt of transparent filters.

12. An arrangement as claimed in any of the claims 7 through 11, characterized in that, in case of parallel projection of any, but not necessarily each continuous belt of transparent filters onto the raster of pixels (α_{ij}) in viewing direction, predominantly such pixels (α_{ij}) are covered, at least in part, by such transparent filters that predominantly or exclusively render bits of partial information from one and the same view (A_k).

13. An arrangement as claimed in any of the claims 7 through 11, characterized in that, in case of parallel projection of any, but not necessarily each continuous belt of transparent filters onto the raster of pixels (α_{ij}) in viewing direction, several such pixels (α_{ij}) are covered, at least in part, by such transparent filters that render bits of partial information of at least two different views (A_k).

14. An arrangement as claimed in any of the above claims, characterized in that the assignment of bits of partial information from the views (A_k) (k=1...n) to pixels (α_{ij}) of the position (i,j) is made according to the equation

$$k = i - c_{ij} \cdot j - n \cdot IntegerPart\left[\frac{i - c_{ij} \cdot j - 1}{n}\right],$$

in which

- (i) is the index of a pixel (α_{ij}) in a row of the raster,
- (j) is the index of a pixel (α_{ij}) in a column of the raster,
- (k) is the consecutive number of the view (A_k) (k=1...n) from which the partial information to be rendered on a particular pixel (α_{ij}) originates,
- (n) is the total number of the views (A_k) (k=1...n) used at a time,
- (c_{ij}) is a selectable coefficient matrix for the combination or mixture on the raster of the various bits of partial information originating from the views (A_k) (k=1...n), and
- IntegerPart is a function for generating the largest integer that does not exceed the argument put in brackets.

15. An arrangement as claimed in any of the above claims, characterized in that, for the filter arrays provided, the filter elements (β_{pq}) are combined into a mask image depending on their transmission wavelength / their transmission wavelength range / their transmittance (λ_b) according to the equation

$$b = p - d_{pq} \cdot q - n_m \cdot IntegerPart\left[\frac{p - d_{pq} \cdot q - 1}{n_m}\right],$$

in which

- (p) is the index of a filter element (β_{pq}) in a row of the respective array,
- (q) is the index of a filter element (β_{pq}) in a column of the respective array,
- (b) is an integer that defines one of the intended transmission wavelengths, transmission wavelength ranges or transmittances (λ_b) for a wavelength or gray level filter (β_{pq}) in the position (p,q), and that may adopt values between 1 and (b_{max}), with b_{max} being a natural number greater than 1,
- (n_m) is an integral value greater than zero that preferably equals the total number (k) of the views (A_k) displayed in the combination image,
- (d_{pq}) is a selectable mask coefficient matrix for varying the generation of a mask image, and

- IntegerPart is a function for generating the largest integer that does not exceed the argument put in brackets.

16. An arrangement as claimed in any of the above claims, characterized in that exactly one array of filter elements (β_{pq}) is provided and the distance (z) between the said array and the raster of pixels (α_{ij}), measured in a direction normal to the raster, is defined according to the equation

$$\frac{p_d}{s_p} = \frac{d_a \pm z}{z},$$

in which

- (s_p) is the mean horizontal distance between two neighboring pixels (α_{ij}),
- (p_d) is the mean interpupillary distance of an observer, and
- d_a is a selectable viewing distance.

17. An arrangement as claimed in any of the above claims, characterized in that all filter elements provided on the filter array or filter arrays are of equal size.

18. An arrangement as claimed in any of the above claims, characterized in that the filter elements provided on the filter array or filter arrays have an essentially periodic arrangement.

19. An arrangement as claimed in any of the above claims, characterized in that the light propagation directions for the partial information rendered on the pixels (α_{ij}) are specified depending on their wavelength/ their wavelength range.

20. An arrangement as claimed in any of the above claims, characterized in that on at least one of the arrays of filter elements (β_{pq}) provided, in at least one row (q) of the array, immediately neighboring transparent filters border on a different number of immediately neighboring transparent filters on row (q-1) than on row (q+1).

21. An arrangement as claimed in any of the above claims, characterized in that each of the filter arrays provided is designed as a static, temporally invariable

filter array and arranged essentially in a fixed position relative to the raster of pixels (α_{ij}), i.e. the imaging device.

22. An arrangement as claimed in any of the above claims, characterized in that at least one pixel(α_{ij}) renders image information that is a mix of bits of partial information from at least two different views (A_k).

23. An arrangement as claimed in any of the above claims, characterized in that the imaging device is either an LC display, a plasma display, or an OLED screen.

24. An arrangement as claimed in any of the above claims, which is provided with a translucent image display device such as, for example, an LC display, and exactly one array of filter elements (β_{pq}), which is arranged (in viewing direction) between the image display device and a planar illuminating device, and which is further provided with a switchable diffusing plate between the image display device and the filter array, so that in a first mode of operation, in which the switchable diffusing plate is switched to be transparent, a spatial impression is produced for the observer(s), whereas in a second mode of operation, in which the switchable diffusing plate is switched to be at least partially diffusing, the effect of the array of filter elements (β_{pq}) is cancelled to the greatest possible extent, so that the diffused light permits a homogeneous illumination of the image display device in the greatest possible degree, and that two-dimensional image contents can be displayed on the said image display device with undiminished resolution.

25. An arrangement as claimed in any of the claims 1 through 23, which is provided with at least one array of filter elements (β_{pq}) which contains pixels of an electrochromic or photochromic design that at least partially act as wavelength or gray level filters, the said array exhibiting, in a first mode of operation, a filter array structure that is suitable for 3D display, especially by means of the pixels that are of electrochromic or photochromic design, whereas in a second mode of operation the pixels of electrochromic or photochromic design are switched to be as transparent as possible, preferably to be essentially completely transparent to the entire visible spectrum.

[CERTIFIED TRANSLATION FROM GERMAN]

26. An arrangement as claimed in Claim 25, characterized in that it is provided with wavelength or gray level filters of electrochromic or photochromic design as well as with wavelength or gray level filters of invariable transmission properties, the said wavelength or gray level filters of invariable transmission properties preferably being essentially completely transparent to the entire visible spectrum.